

REMARKS

Reconsideration of this patent application is respectfully requested in view of the foregoing amendments, and the following remarks.

The amendments to this patent application are as follows. The drawings have been revised to contain red ink changes that denote the 4 planet wheels 7a, 7b, 7c, and 7d, as well as the other 4 planet wheels 11a, 11b, 11c and 11d.

The amendments to the Specification are as follows. All specific claim references have been deleted from the disclosure of the Specification on Page 1 thereof. The paragraph bridging pages 2 to 3 of the Specification has been amended to recite the second planet wheels 7a, 7b, 7c and 7d. Page 3 of the Specification has been amended to recite planet wheels 11a, 11b, 11c and 11d. Also amended page 3 recites that the "Planet wheels 11 engage the third internal gear 12. The internal gear 12 of the third stage is rigidly connected with the transmission housing. "Thus proper antecedent basis is provided for the internal gear 12.

The amendments to the claims are as follows. Claim 8 has been amended to change "in a planet carrier" to--on a planet carrier--.

Claim 8 was objected to for reciting two different embodiments in the alternative within one claim. Thus claim 8 was amended to cancel therefrom the embodiment directed to the "transmission housing." Newly added claim 9 is based upon, and is supported by claim 8, except that claim 9 recites the embodiment of the transmission housing canceled from claim 8. Thus claim 8 recites the embodiment wherein connection is with "the planet carrier of the third stage."

In summary, the drawings have been amended to show every feature of the invention specified in the claims. The Specification has been amended to cancel any references to the claims, and to provide proper antecedent basis for claimed subject matter, and proper antecedent basis for features added to the drawings. Claim 8 was amended to overcome the formal objections thereto.

For all of the above reasons, it is firmly believed that the drawings, the Specification, and the claims are now in complete compliance with the requirements of 35 U.S.C. 112. Withdrawal

of this ground of rejection is respectfully requested.

The Applicant comments upon the prior art rejections of the claims as follows.

The present invention is directed to a three stage, speed-reducing planetary transmission having, in each stage, a driven sun wheel rolling in an internal gear and interacting with a planet wheel mounted on a planet carrier, in which the sun wheels of the second and third stages are each driven by the planet carrier of the preceding stage, and a fixed transmission housing, in which at least the internal gear of the third stage is rigidly connected with the transmission housing and the internal gears of the first and second stages are each rigidly connected either with the planet carrier of the third stage or the transmission housing, and in which, furthermore, the planet carriers of the second and third stages are each provided with four planet wheels across their width, wherein

- the internal gears (6, 12, 13) each have a number of teeth  $z = 108$  in all three stages,
  
- the transmission ratios are  $i = 4$  for the second stage and  $i = 5.5$  for the third stage.

In the Office Action, the published patent documents, namely US Patent No. 2,591,967 (*RIDGELY*) and DE 19840 968 A1 (*SHIROKOSHI*) were the basis of prior art rejections of the claims. In the Office Action, it was contended that the mere selection of defined gear or transmission ratios with respect to a defined number of teeth for the hollow gears used could not be viewed as an inventive achievement. It was contended that such a selection could be made by one skilled in the art in an obvious manner. This is respectfully traversed.

The *Ridgely U.S. Patent No. 2,591,967* from column 1 line 52 to column 2 line 4 discloses a planetary gear train wherein there is an insertion in holes through the planetary gear studs of a plurality of ball bearings 41, of such diameter relative to the axial length of the studs as to cause the end balls to protrude slightly beyond the ends of the studs, and the provision of washer-like scuff or bearing plates against which the balls may roll.

*Ridgely* in column 3 in lines 65 to 73 discloses that one of the outstanding advantages of the gear train of *Ridgely* lies in the utilization of the studs 18 as carriers for the ball bearings 41. By means of this arrangement the unit need not be lengthened as would be the case if a conventional ball-type thrust bearing

were employed. The plates 32 and 34 may be of thin stock and therefore add to the overall axial dimension only to a negligible degree.

Contrary to the prior art references to *SHIROKOSHI*, and to US Patent 2,591,967 to *RIDGELEY*, the present invention solves the problem of how to achieve a high transmission or gear ratio with high torques and high rigidity of the transmission at the same time, combined with the smallest possible volume for the construction. The objective is to make it possible in that connection to manufacture the transmission with simple means at favorable cost, and such a gearing should assure a long-lasting, low-wear operation with low-play transmission.

This object is achieved according to the present invention in a surprisingly good and simple manner with a planetary gear transmission with the following claimed features:

the internal gears (6, 12, 13) each have a number of teeth  $z = 108$  in all three stages, and

the transmission ratios are  $i = 4$  for the second stage and  $i = 5.5$  for the third stage.

The Ridgely patent only discloses the importance of the studs 18 as carriers for the ball bearings 41. There is no teaching of the claimed structure.

In connection with hollow gears with the number of teeth of  $Z = 108$ , which is usual for planetary gear transmissions for various reasons, an important advantage of the invention lies in the realization of a reduction of  $i = 5.5$  in the third and thus the last driving stage, using at the same time 4 planetary gears, which is unusual in connection with planetary transmissions. Such a non-integral gear ratio is unusual because basically, exclusively integral gear ratios are realized in transmission technology for standardization reasons, among others.

With the use of 4 planetary gears and a hollow-gear tooth number of 108, the inventor surprisingly found that a maximal transmission of the torque is possible with a gear ratio of exactly  $i = 5.5$ . By combining the gear ratios of  $i = 4$  in the second transmission stage, and  $i = 5.5$  in the third transmission stage, the integral transmission normally found in connection with transmissions is achieved overall.

With a gearing reducing to the slow speed, the output stage of the gearing is loaded with the highest torque, so that it is important to design exactly this last stage for optimally absorbing a high torque.

By designing the second and third transmission stages as defined by the invention, planetary transmissions with a small construction volume and, at the same time, high torques to be transmitted, and additionally with an extremely high rigidity of the transmission, are created in a surprisingly efficient manner.

As proof of the substantial benefits achieved with the claimed invention versus the prior art, submitted herewith are a number of trade publications, among which the "TB High-Torque" transmission described there corresponds with the present invention. Some of the publications are in German, with the exception of the one that describes the excellent innovational power of the business operation of the Applicant. .

The enclosed trade publications are as follows:

- from "Antriebstechnik: Precision Planetary Transmissions with High Output Density - The Quantum Leap (1 sheet).

- from "Fabrikautomation" 14, 2001: Double Torque - Same Construction Volume (1 sheet).
- from "Industrieanzeiger": Intelligent Transmissions Appear On The Horizon (1 sheet).

Note: The transmission as defined by the invention is described with reference to Alpha Getriebbau GmbH in column 2, up to column 3.

- from "Antriebstechnik": Planetary Transmission with Torsional Rigidity. (1 sheet)
- from "Fluid", March 2001: Double Torque, Same Construction Volume (1 sheet).
- from "Markt und Mittelstand": Turbo for the Mini-Gearing (1 sheet).
- from "Betrieb und Meister" 4/2001: Higher Acceleration Torque (1 sheet).
- Alpha Getriebbau GmbH: Text (1 sheet).

In conclusion, the present invention, and all the claims, are believed to be patentable under 35 U.S.C. 103 over all the prior art applied by the Patent Examiner. A prompt notification of allowability is respectfully requested.

Respectfully submitted,

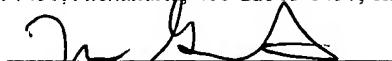
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Enclosures: 1) Trade Publications  
2) Marked up Copy of FIGS. 1 and 2 in Red Ink

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 27, 2003.

  
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